

REMARKS

Reconsideration of this application is requested in view of the amendments to the specification and claims and the remarks presented herein.

Only claim 10 is in the application, all other claims having been cancelled.

The specification has been amended in accordance with the Examiner's suggestion and claim 10 has been amended to obviate the Examiner's objections thereto.

Claim 10 stands rejected under 35 USC 103 as being obvious over the Adachi patent taken in view of the Seamone patent. The Examiner states that the Adachi patent discloses a valve timing control system comprising a valve timing varying system having a control valve with the valve timing system having a meshing engagement of splines and cylindrical sections to adjust the angular rotation and teaches everything in claim 10 with the exception of failing to disclose compensating for a fluid leakage at the delivery passages by modifying the radii of the control edges of the lands. The Examiner cites Seamone as teaching a low axial force valve spool changing the spool edge contours to compensate for pressure flow resulting in a spool edge configuration with low flow reaction forces as well as low spool null leakage and deemed it would have been obvious to one skilled in the art to utilize the teaching of Seamone in the valve timing varying device of Adachi since the use thereof would have provided an additional means to

compensate for fuel leakage other than varying the lengths of the spool ends.

Applicants respectfully traverse this ground of rejection since it is believed that the combination of the prior art that the Examiner has made with the benefit of Applicants' disclosure does not anticipate or render obvious Applicants' invention. The Examiner's allegation that the Adachi patent only fails to disclose compensation of fluid leakage at the delivery passages by modifying the radii of the control edges of the lands is not correct. In the second paragraph of page 4 of the office action, the Examiner states that Adachi teaches blocking communication between the hydraulic pressure feeding passage 29 and the hydraulic passages 1a, 1b and a third adjusted position of the spool. This is not the case in Applicant's invention. In the third adjusted position, the spool valve allows fluid to flow to at least one chamber to compensate leakage as taught in the second paragraph of page 2 of the application. Only a high resistance between the forces claims as spool valves in general allow communication between the pressure feeding port in the hydraulic passages when the spool is positioned in the blocking position.

Moreover, the Examiner states that the Seamone patent teaches a low axial force valve spool changing the spool edge contours (radii) to compensate for the pressure flow resulting in a spool edge configuration with low flow reaction forces as well as low spool null leakage. Applicants contend that Seamone does not deal with camshaft phasers but with servo mechanical control systems for guided missiles and aircrafts as taught in lines

10 to 42 of column 1. Moreover, Seamone does not solve the problem addressed in the pending application since Seamone seeks to reduce the force acting on the spool due to fluid flow.

In Applicants' application, two hydraulic chambers are described which are divided by a piston. Due to friction forces acting on the camshaft, the piston tends to move in that direction, that the volume of the first chamber decreases and the volume of the second chamber increases. This leads to an increase in leakage flow from the first chamber compared to the leakage flow from the second chamber. The configuration of the spool allows fluid to flow more easily to the first chamber than to the second chamber. Therefore, refilling the final chamber and compensating for the leakage effect.

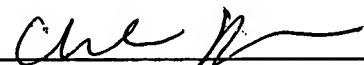
A third reason is the configurations of the spools are different. Seamone teaches using partial circumferential openings (line 52, column 1) like wedges, rectangular slots or flat cuts (lines 2 to 14 of column 5). In Applicants' invention, the radii of the edges are different which means the entire circumference of the edge (the whole circle) is effected. There are no partial circumferential openings but, rather, the whole circumference acts as the annular opening. Moreover, the openings are located on edges which block the communication between the pressure feeding passage and the hydraulic passages feeding the chambers. In the Seamone reference, the wedges are located on the edges of the spool which block communication between the hydraulic lines and the return lines and Seamone is involved with a different problem working in a different

field of engineering and the solution is different considerably.

Moreover, in Applicants' invention, the spools are generally produced in a turning process and the spool described in the application can be produced in a single step, namely, one turning process. Compared to the spools in the state of the art, a slightly modified tool has to be used which causes no additional cost. To produce the Seamone spool, a second production step is necessary to cut the wedges after the turning process which leads to considerable extra cost and extra time in the production process of the spool. Therefore, the combination of the prior art cited by the Examiner does not anticipate or render obvious Applicants' invention and withdrawal of this ground of rejection is requested.

In view of the amendments to the specification and claims and the above remarks, it is believed that the claims clearly point out Applicants' patentable contribution and favorable reconsideration of the application is requested.

Respectfully submitted,
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Enclosure